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DEVELOPMENT OF MACHINE-TOOL BUILDING IN CHINA

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## FOREWORD

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## DEVELOPMENT OF MACHINE-TOOL BUILDING IN CHINA

[Following is the translation of an unsigned article in Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), No 1, Alma-Ata, January 1960, pages 84-86.]

During the ten years which have elapsed since the time of the formation of the Chinese People's Republic, machine tool building became a leading branch of machine-building industry which is developing rapidly. The growth of the machine tool production was particularly rapid during the years of the first five-year plan (1953-1957) and in 1958. During the execution of the first five-year plan, the average yearly increase of the machine tool output was approximately equal to 3000 articles. In 1957, 28,000 machine tools were produced, and in 1958 - 50,000, i.e. almost twice as many (not including machine tools of simplified designs).

Following a quantitative growth of machine tool building, the assortment of the production of the machine tool plants was expanding. In 1957, more than 200 types of metal-cutting machine tools, including automatic and semiautomatic, were produced in the Chinese People's Republic, while in 1958, only a little more than 40 types of machine tools of obsolete designs were produced there.

During the five-year plan period, production of a number of machine tools was started, such as planing machines, vertical boring and turning machines, gear-cutting machines, turret lathes, grinding machines and many others. During this period, machine tool building enterprises of Chinese People's Republic started producing certain types of heavy machine tools which included the universal horizontal boring machine, the milling machine and the double-ended vertical boring and turning machine. The latter was intended for processing large size machine parts up to 10 tons in weight. The planing machine, which is manufactured by the Machine Building Plant No. 2 in the city of Chinan (Shantung Province), is used for processing parts 2 m. wide and 6 m. long.

In 1958 special attention was given to putting new types of machine tools into production. At 19 big government machine tool building plants alone, machine tools of 145 new types and sizes were put into production. Among them were: Turning and milling machines with program and electronic controls, milling machines having a milling length of 5 m., planing machines having a planing length of 14 m., etc.

Precision machine tool building was developing successfully in 1958. At the Shanghai Machine Building Plant, the first gear-grinding machine of high precision, in China, was created. At the same factory the production of a high-precision thread-grinding machine is being developed.

The K'unming Machine Tool Building Factory in the Yunnan Province began, in 1958, to produce duplicate - milling machines for processing machine components of irregular outline - semiautomatic machines with an electronic control system. Soviet models were used in manufacturing these machine tools.

Semiautomatic hydraulic duplicate-milling machines, the production of which has been setup at the same plant, are characterized by their compactness and high precision, and are simple to use. Experiments conducted with samples of these machines have shown that in their technical and economical indices they are not inferior to machines produced in well developed capitalistic countries. One of the best precision machine tools in China, the coordinate boring machine, is also produced at the plant in K'unming. On this machine, parts can be processed with the tolerance of less than 1 mk.

Highly productive automatic machine tools are becoming more and more important in the Chinese machine tool production. On the single-mandrel automatic turning lathe (Nanking Machine Tool Building Plant), the processing of machine parts is completely automatized, and a high precision of processing (to 5 mk.) and excellent fineness of the surface are achieved. A turning automatic lathe produced by Shanyang Machine Building Plant No. 3 is equipped with electric control system. With four carriages, four machine parts can be processed simultaneously on the lathe.

Multicutting semiautomatic duplicate-turning machines are produced by a machine tool building plant in the city of Dalian (Liaoning Province). The same plant produces double- horizontal aggregate lathes with 24 spindles. In processing parts of the same kind, the productivity of this lathe is 5 times as great as that of the usual universal one. The lathe was completely designed by Chinese designers.

The degree of automatization of an internal grinding machine (Machine Tool Building Plant at Wuhsi) is also high. The latest advanced techniques are being introduced - electric spark method of processing machine parts, application of ultrasound, electronics, etc.

In the past few years, a great volume of work in capital construction has been accomplished in the Chinese People's Republic. The Machine Tool Building Plant at Shenyang (Liaoning Province) was radically reconstructed. At the present time, this plant is a high-capacity modern enterprise equipped with the latest machinery. Its designed capacity after the reconstruction is seven times greater than before.

The reconstruction of a machine tool building plant in Shanghai has been rapidly completed. This plant had been created on the basis of the existing agricultural implement producing shops. At present, this plant manufactures precision grinding machines.

During the period of the first five-year plan, the production of machine tools by this enterprise increased by 30% and at present as many as 10-12 modifications of grinding machines are put into production every year. A special bureau for designing new types of machine tools has been established at the Shanghai Machine-Tool Building Plant.

At the beginning of 1958, the Shanghai Machine-Tool Building Plant (at T'aiyuan) was put into operation after reconstruction. The reconstruction work was planned by Chinese engineers with the help of Soviet specialists. Basic funds of the enterprise were increased eight times.

During the period of the first five-year plan the construction of two large machine tool building plants in Peking and Wuhan was started. The Peking Machine Tool Building Plant which was completely designed by Chinese specialists, is intended for producing universal and milling machines. The Wuhan plant for heavy machine tool building, whose construction was started in April of 1956, began operating in July of 1958, one and one-half years earlier than the planned date. This large enterprise equipped with the most modern machinery was built with the help of the Soviet Union.

This plant started to produce machine tools while it was still under construction. More than 200 heavy machine tools of 12 types were manufactured before the end of the year. At the end of 1958, the construction of a new shop was started at the Wuhan plant which will produce machine tools of 200 tons and more in weight. In October of 1958, the construction of a plant for heavy machine tools was started in the city of Urumchi - the largest machine-



building enterprise in the Hainchiang-Uigur autonomous region (which was formerly one of the most backward regions of China).

The construction of a machine tool building plant in the city of Hefei (Anhui Province) with a projected capacity of 6000 machine tools a year is in progress.

Along with the construction of machine tool building enterprises, an extensive construction of plants for the production of measuring and cutting instruments is in progress. In 1958, a plant for measuring and cutting tools was put into operation in the city of Ch'engt'u (Szech'uan Province) which was built according to the designed plans of an analogous plant in the city of Harbin. Because of certain changes in the project, the construction of the plant in Ch'entu required 2/5 less capital than the construction of the Harbin plant. In addition to this, the construction time was considerably reduced and the output capacity was increased approximately by one and one-half times.

At the present time the plant for measuring and cutting tools in Ch'entu is the largest tool manufacturing enterprise in China. It manufactures cutting measuring tools of 2086 types and sizes.

A factory for abrasive materials in Chengchow (Henan Province) will soon be ready for operation. The construction of this factory is carried out with the help from the German Democratic Republic. This factory will manufacture polishing disks, emery paper, abrasive powder, etc. The capacity of the factory will permit to satisfy a considerable part of the needs of machine building industry of China in abrasive materials.

Vigorous development of machine building in the Chinese People's Republic in 1958 (the volume of total production of machine building grew in 1958 in comparison to the preceding year by 80%) required a considerable increase in the output of metal cutting machine tools. Therefore, along with a considerable growth of machine manufacturing in specialized machine tool building plants, a great number of lathes were manufactured in other enterprises of machine building industry. One of the first such enterprises which started manufacturing metal cutting machines is the Loyang Tractor Factory which is now under construction. During the second half of 1958, 430 lathes were manufactured at this factory.

The Shanghai Machine Factory "Henghsin" having primitive equipment in the past began to manufacture machine tools for its own needs and, at present, became a high capacity enterprise which can manufacture several types of modern metal cutting machines. By the end of 1958, more



than 50 heavy machine tools were produced at the "Henghain" Factory. The production of machine tools was also developed at the T'ienchin Factory of forging and pressing equipment, at the Ch'ungch'ing Compressor Factory and other enterprises.

In connection with the shortage of heavy type equipment for the manufacturing of parts of large machine tools, the method of processing large parts with several small lathes is practiced on a large scale by small machine factories. This method was first used at a machine factory in Shenyen. This method consists in fastening a part securely and placing the processing machines around it or even on it. The processing machines used in this method are simple in their construction and are not complicated from an engineering point of view and their manufacturing is successfully accomplished by a number of small machine building enterprises. At the present time such a method is used not only in machine tool building, but also in other branches of machine industry of the Chinese People's Republic.

One of the innovations of the Chinese machine tool building is the production at some factories of metal cutting machines with bed plates made of concrete, which permitted to economize a considerable amount of metal, to shorten the production time of the machines and to develop machine manufacturing at factories which did not have foundries or heavy equipment.

In July of 1953, a large planing machine was developed at the Ch'ungch'ing Compressor Factory (Szechuan Province) in which the bed and the gantry are a sturdy reinforced concrete construction. At the Nanking Machine-Tool Building Plant, reinforced concrete is used as material for the beds of screw-cutting lathes, and at the Shanghai Electric Machine Factory a vertical boring and turning machine with the face plate diameter of 5 m. was built with the use of reinforced concrete.

Reinforced concrete was also used in the manufacturing of machine tools of other types as well as in modernization of some existing lathes in order to broaden their production potentialities.

The increase in the production of small local enterprises and the creation of the industrial basis in people's communes made it necessary to produce a large number of small metal-cutting lathes of simplified designs. Along with the big machine building plants, small factories and shops participated in the production of lathes of such type. The production of these enterprises were chiefly used to satisfy their own needs. In the people's commune "Nantu" in the province of Chiangsu, an agricultural implements plant produced more than 100 metal cutting lathes in 1953. A

movement for the production of the simplest lathes with independent efforts also spread in other regions. It is sufficient to say that apart from 50 thousand large modern lathes, more than 40 thousand small lathes of simplified types were manufactured in the Chinese People's Republic in 1958.

The successful fulfillment of the plan of 1958 for the production of metal-cutting machine tools in the Chinese People's Republic shows that the goal which Chinese machine tool builders had set for themselves - to overtake England in the production of machine tools within the next 10 years, will be fulfilled much sooner. At the end of the first five-year plan (1957) the output of machine tools in the Chinese People's Republic was only 40% of the machine tool output in England (28 thousand and 70 thousand respectively), while in 1958 this gap already diminished considerably.

because the production of machine tools in the Chinese People's Republic almost doubled and in England it somewhat lowered during the same period.

The government plan for the development of national economy of the Chinese People's Republic for 1959 projects to bring the yearly output of metal-cutting machine tools to 60 thousand items. Along with the quantitative growth of production, it is also planned to broaden further the assortment of the production of machine tool industry in order to produce machine tools of more than one thousand types and sizes by 1962.

Particular attention will be given, as in the past years, to the development of the production of universal and special heavy lathes in order to reach the contemporary level of England in this particular type of production which determine the state of this branch as a whole.

In 1958 only one-half of the demand of the national economy of the Chinese People's Republic for heavy metal cutting machine tools was satisfied by domestic production. In order to fully satisfy the needs of the industry, the output of heavy machine tools should be increased, in comparison to 1958, by six or seven times within the next few years. Along with this, it is planned to broaden the production of simple inexpensive lathes of high quality for the needs of local industry and particularly for agriculture.

Special attention will be given to the development of designs of simplified machine tools which could be operated not only by electric motors, but also by other types of motors, such as locomobiles, gas engines and others. During the second five-year plan, it is projected to produce 400-500 thousand small machine tools of simplified designs.